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(54) Supporting floor formwork

(57) Primary 8 and similar transverse secondary beams 9 for supporting floor formwork are mounted on drop-head supports 5 with further transverse secondary beams 9A supported on longitudinal flanges 10 on the beams 8 so that the upper surfaces of the secondary beams 9 and 9A are an equal distance above that of the primary beams 8 so as to be flush with the

peripheral part of the formwork 100, 200 etc. The drop heads include locating holes 55 for tongues on beams 8 and locating flanges 56 for like tongues on beams 9. The heads have a base plate 58 co-operable with a locking plate 61 and pegs 63.

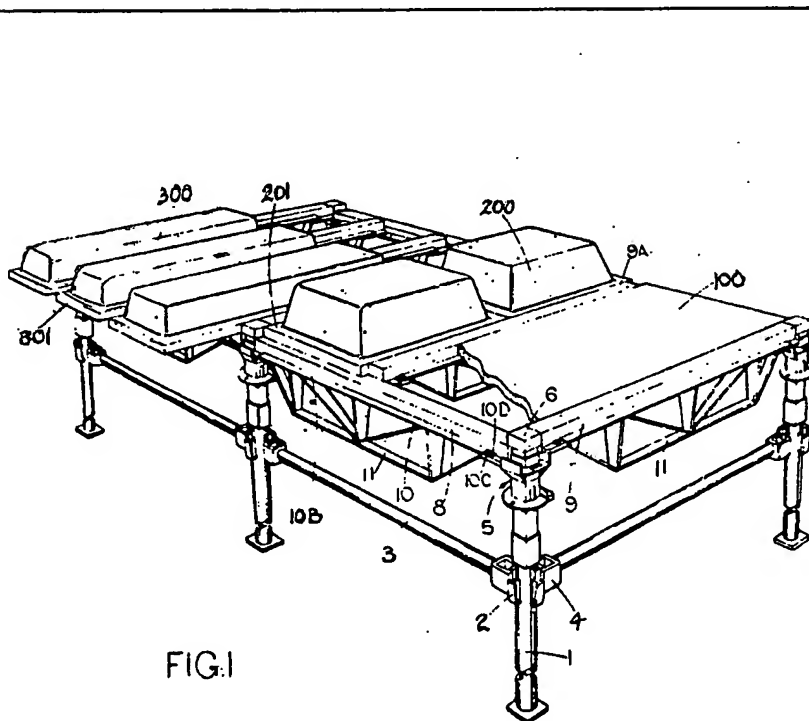


FIG. 1

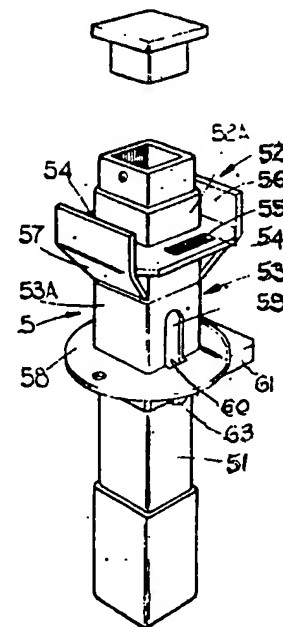


FIG. 4A

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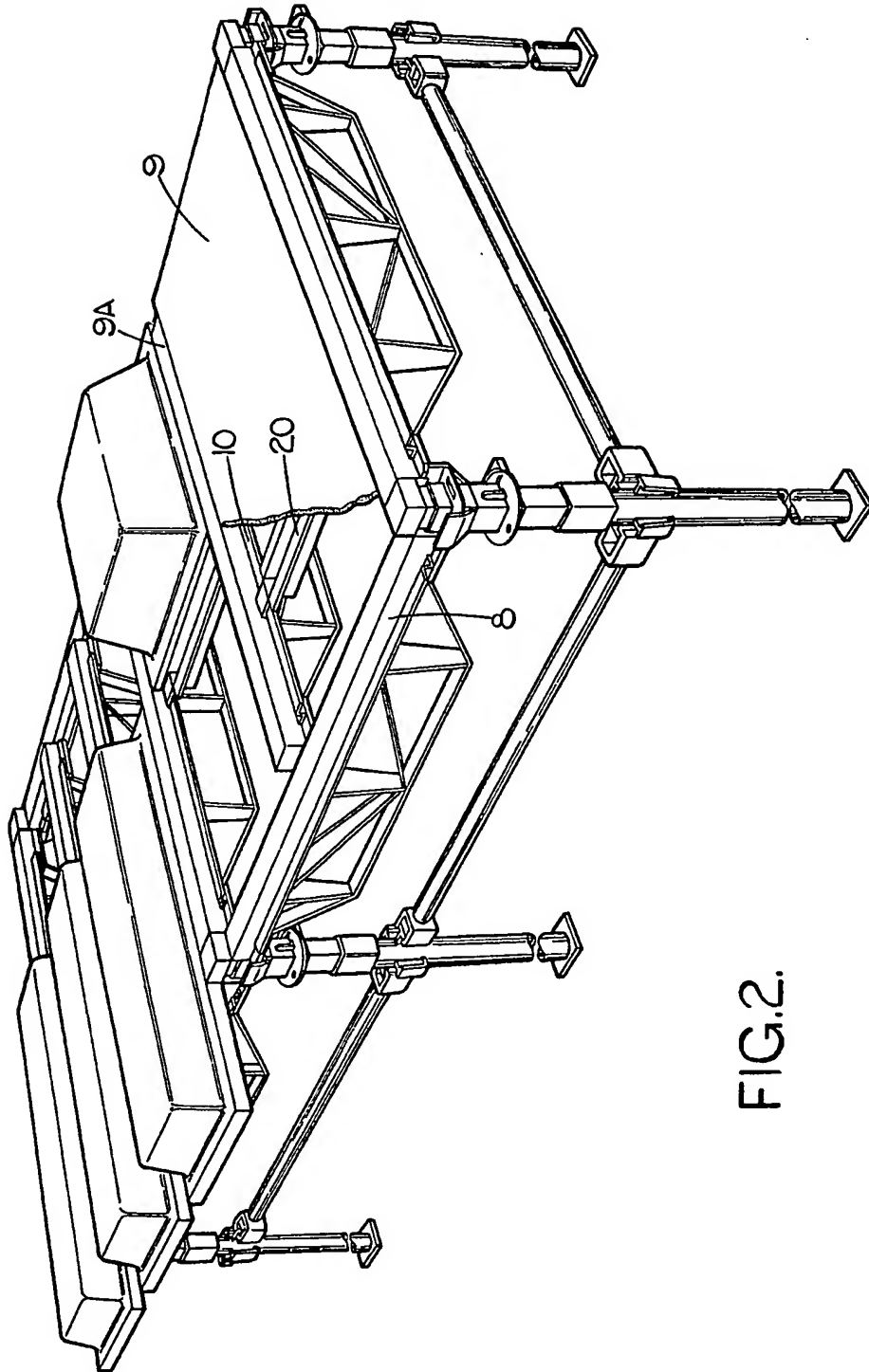
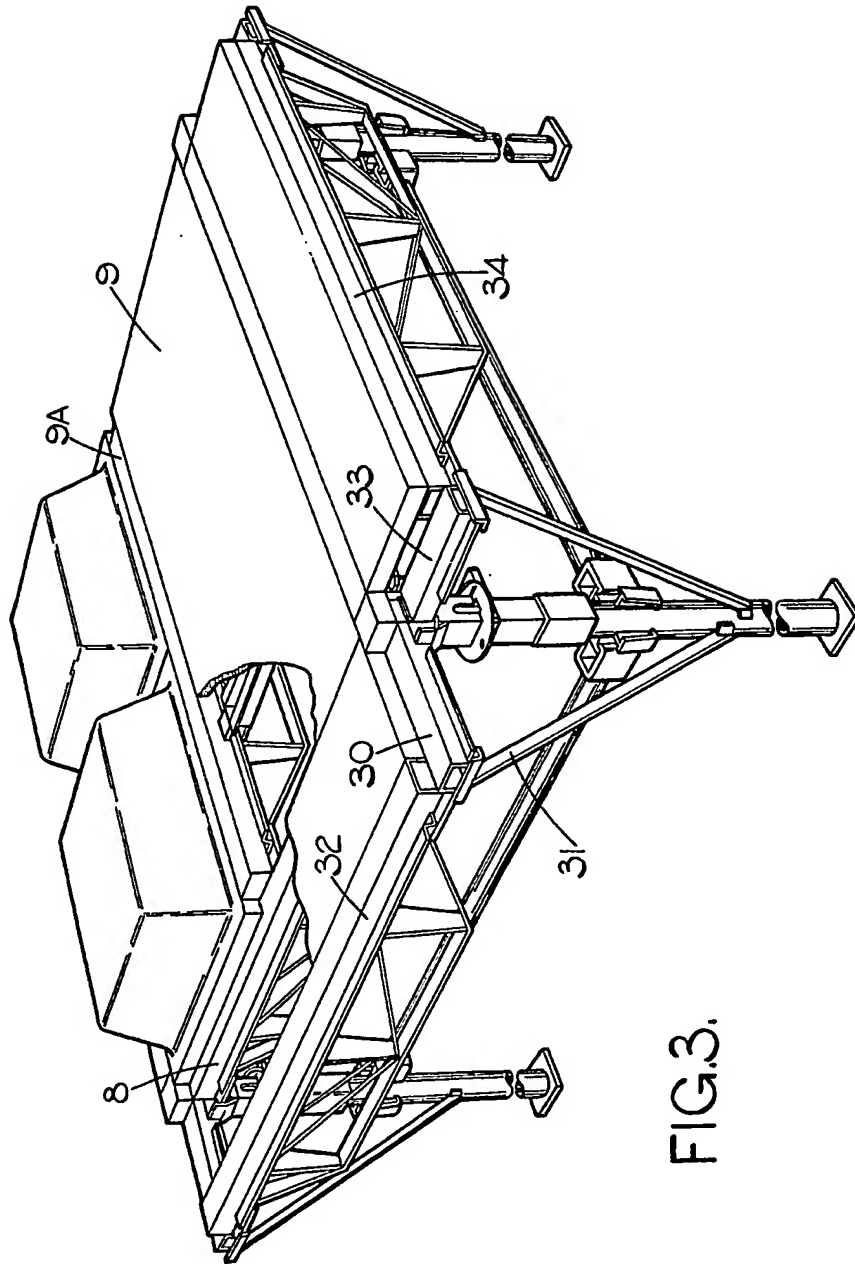


FIG.2.

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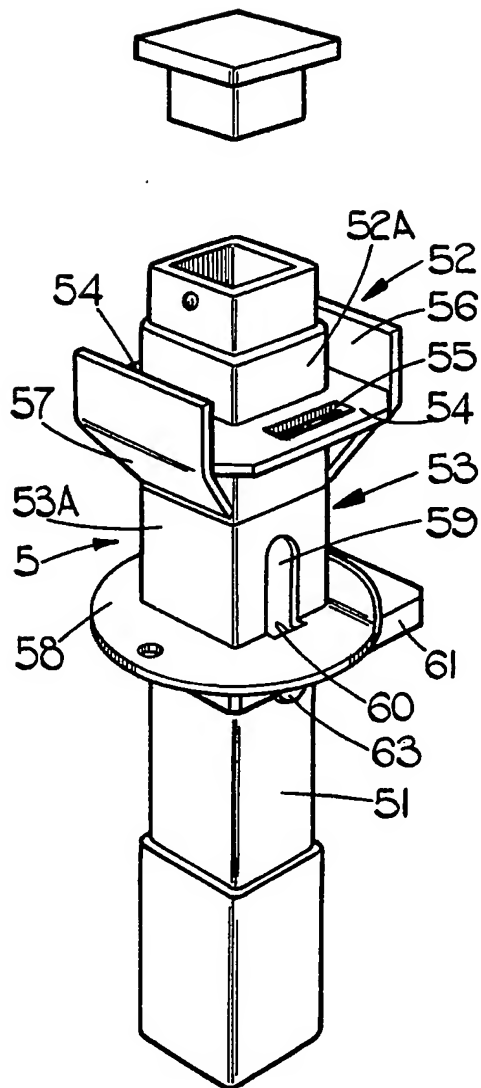


FIG. 4A

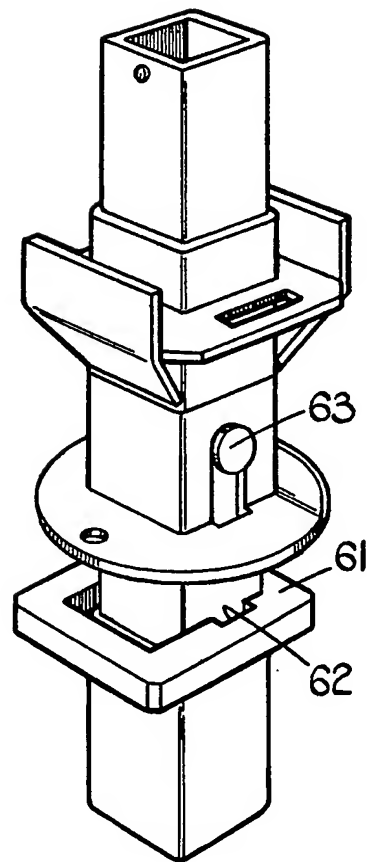
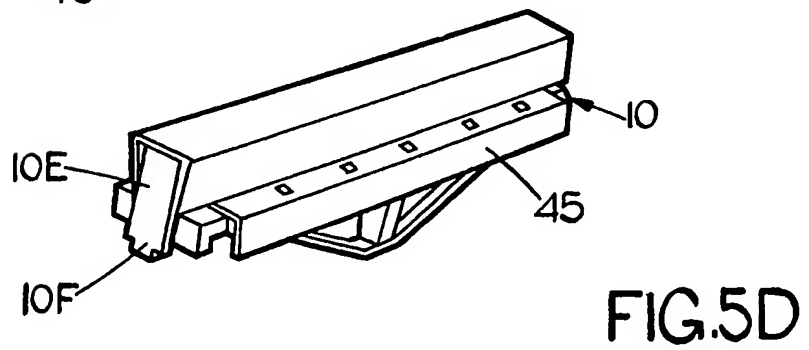
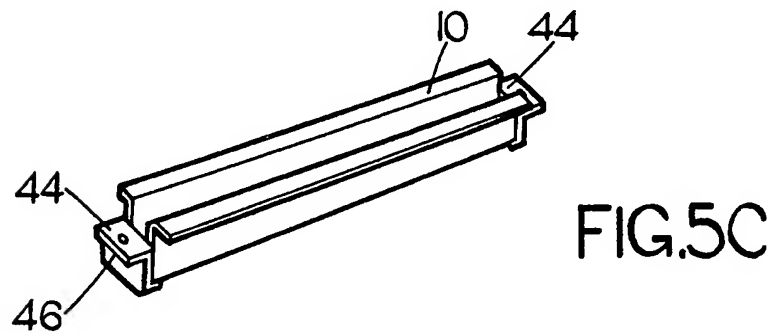
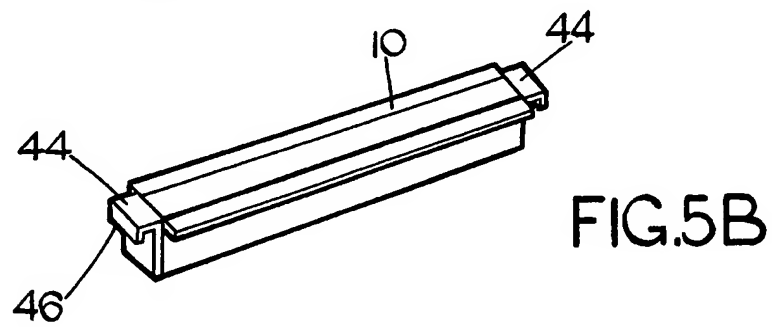
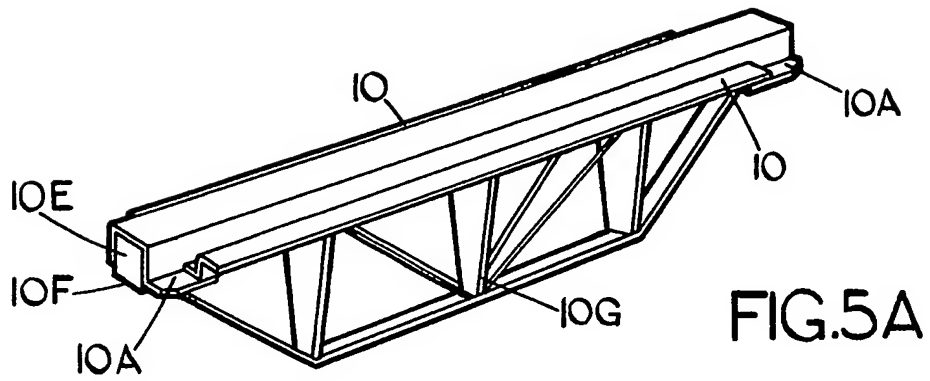


FIG. 4B

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SPECIFICATION

Formwork support system

5 This invention relates to a formwork support system for use in building and particularly during the casting of concrete structures such as floors and decks.

10 According to the invention, a formwork support system for use in the casting of a concrete structure comprises a plurality of support heads each adapted to be mounted on a respective generally vertical scaffolding member, a plurality of primary beams each
15 adapted to be supported by respective heads on a spaced pair of said members, a plurality of secondary beams adapted to be supported by said heads to extend transversely of the primary beams with their upper surfaces disposed above those of the primary beams by a
20 distance equal to the thickness of a peripheral portion of formwork of the system, the beams each having longitudinally extending support flanges arranged so that, when they are acting
25 as primary beams, further secondary beams extending transversely thereof may be supported on the flanges with their upper surfaces disposed by said distance above those of the beams upon which they are supported.
30 In one convenient arrangement, at least some of the support flanges include a pair of flange portions extending generally perpendicular to a side of the beam joined by a flange portion extending generally parallel to that
35 side, whereby a locating channel is formed between the parallel flange portion and that side.

The invention will now be described, by way of example, with reference to the accompanying drawings in which:—

40 *Figure 1* is a perspective view of one embodiment of the formwork support system of the present invention;

Figure 2 is a view similar to *Figure 1* of a modified form of the system of the invention;

45 *Figure 3* is a perspective view of part of a further embodiment of the system of the invention incorporating cantilever peripheral extensions;

50 *Figure 4A* is a perspective view of one form of support head of the system of the invention shown in a first position;

Figure 4B is a view similar to *Figure 4A* of the head in a second position, and

55 *Figures 5A to 5D* illustrate various forms of beam used in the system of the invention.

Referring to *Figure 1*, this shows a formwork support system supported on a plurality of upright scaffolding tubes 1, four of which
60 are disposed at the corners of a rectangle and two of which constitute intermediate supports, although it will be understood that any convenient number of intermediate supports may be provided. The supports 1 are provided with
65 lugs 2 which act to locate cross tubes or ties

3 engaged with the lugs, in this embodiment by means of generally U-shaped brackets 4 welded or otherwise secured to the ends of the tubes 3. The upper end of each support 1 carried a head shown generally at 5 having means for supporting beams at two different levels, as will be described in more detail hereafter.

70 Primary support beams 8 are supported on the heads 5 and extend in parallel relationship along opposed sides of the scaffolding. Secondary outermost beams 9 extend in parallel relationship at right angles to the primary beams 8 and are also supported by the heads
75 5. Intermediate secondary beams 9A extend between the primary beams at right angles thereto and are supported directly on the primary beams by way of longitudinal flanges 10, one of which extends along each side of
80 each primary and secondary beam. All the beams preferably have strengthening lattice 11 and, for purposes of standardization, all the primary and secondary beams are very desirably identical, but this need not necessarily be so. As mentioned above, the primary
85 and secondary beams are supported by the heads at different levels, and these are such as to provide a vertical spacing between the upper surfaces of the primary and secondary beams equal to the thickness of those portions
90 of formwork, primarily the peripheral portions, which will, in use, engage the beams and flanges.

Each flange 10 consists of an upper horizontal portion 10B which provides the beam-supporting surface of the flange. This is joined by a vertical portion 10C to a lower horizontal portion 10D which is connected, as by welding, to the adjacent vertical side of the associated beam. Support plates 10A are secured to the flanges 10 as shown by welding. It will be seen that the flange 10 forms a channel which, as will now be described, serves to
100 locate beams supported on the flange.

105 Referring to *Figure 5A*, this shows a typical beam which may be used as a main primary or secondary beam or as an intermediate secondary beam. It is basically a pressing of inverted 'U' section, having plates 10A and flanges 10 secured thereto or formed integrally therewith as convenient. At each end of the beam is an end plate 10E having a downwardly projecting tongue 10F which interfits, either with a suitable formation in the head 7, or extends into one of the channels of the flanges 10 when the beam is used as an intermediate secondary beam. The tongue 10F could be replaced by any convenient formation such as a stud or studs projecting below the beam end to locate in the head formations or in the beam flange channels.
110 115 120 125

A number of alternative types of formwork for use with the system of the invention are illustrated in *Figure 1*; a flat formwork is indicated at 100 and consists of a sheet of

plywood of standard 25 mm thickness. This is supported between secondary beams 9 and 9A on respective opposed flanges 10 of the beams which, in the present construction are disposed 25 mm below the upper surfaces of the beams so that the upper surface of the formwork is flush with the upper surfaces of the secondary beams. Moreover, the upper surfaces of the primary beams are 25 mm below those of the secondary beams, so that the formwork 100 can rest on the primary beams and, if necessary, bridge across such beams on to a further part of the scaffolding, without causing an interruption in the formwork surface. Alternative formwork in the form of waffles is indicated at 200. The peripheral edge portions 201 of the waffles, which in use will be horizontal, again have a 25 mm thickness so that, with the waffles disposed as shown, the upper surfaces of the portions 201 will be flush with the upper surfaces of the secondary beams. A further type of formwork is shown as troughs 300, which have peripheral portions 301. It will be seen that the troughs 300 bridge across the primary beam 8 and may co-operate with similar or alternative formwork disposed on adjacent scaffolding.

The head 5 will now be described in more detail with reference to Figures 4A and 4B and consists of a fixed portion 51 on which are mounted an upper movable portion 52 and a lower movable portion 53. The upper portion has a body 52A of generally rectangular cross-section, surrounded by a support plate 54. The plate 54 has opposed laterally projecting parts, each of which has a slot 55 such as to receive a tongue 10F of a beam (Figure 5A) disposed as a primary beam. One of the slots 55 is hidden from view in the drawing. The plates 54 are provided with upstanding flanges 56 extending along their edges perpendicular to the slots 55, the flanges being joined to these edges for example by welding and having stiffening webs 57 projecting therefrom downwardly into engagement with an adjacent surface of the head portion 52, to which they are secured, again conveniently by welding. Secondary beams are supported by the flanges 56 at a higher level than the primary beams, the tongues 10F projecting behind the flanges to provide lengthwise location. Lateral location may be provided in any convenient manner, as for example by wire clips or wedges acting between the head and beam.

The lower movable head portion 53 has a central body 53A, surrounding and secured to which is a flange 58. The body 53A has slots 59 formed respectively in opposed sides thereof and these are continued into respective notches 60 in the flange 58. A locking member 61 surrounds the fixed member 51 and has notches 62 corresponding to those 60 in the flange 58. Projections 63 are provided on

opposed sides of the member 51 in longitudinal alignment with the slots 59 and notches 60 and 62. The locking member 61 closely surrounds those sides of the member 51 having the projections 63, but has a larger internal dimension than the member 51 in the direction perpendicular to the projections, enabling it to be moved laterally of the head between positions respectively in which the notches 62 are aligned with the projections and in which the notches are not so aligned, for the purpose to be described.

Figure 4A shows the head in its raised position, adopted when it is desired to use the system of the invention in the casting of a concrete deck or the like. It will be seen that the lower movable head portion 53 has been raised to a position in which it is wholly above the projections 63, which latter pass along the slots 59 and through the notches 60 and 62 in the flange 58 and locking member 61 as the head is raised. The member 61 is then moved across to take the notches 62 out of alignment with the projections 63, being thus prevented from moving downwardly and acting to support the head portions 52 and 53 in their raised positions. The scaffolding of Figure 1 can then be constructed by attaching the primary and secondary beams 8 and 9 to the raised heads of the uprights and adding secondary beams 9A and formwork as desired to provide the required soffit of the structure, such as a ceiling, to be cast. By virtue of the system of the invention the formwork can be arranged in relation to the primary and secondary beams so that the horizontally extending portions of the formwork are flush with the upper surfaces of the secondary beams and no infilling of corners and other irregularities has to be performed.

After casting of the concrete over the formwork, an initial period of two or three days are allowed to elapse, after which the movable portions 52 and 53 of the heads are lowered by displacing the plates 61 laterally until the notches 62 are once more in alignment with the projections 63, enabling the latter to move back into and along the slots 59. Lowering of the heads lowers the supporting primary and secondary beams, leaving the cast structure supported only by the heads 6 or cap plates 6A when used. It is thus possible to remove the beams for subsequent use, while the structure is left supported on the heads for a further period of several days until completely hard, after which the scaffolding may be removed. The thickness of the caps, shown different in Figures 1 and 4A may be chosen according to the thickness of formwork employed.

Figure 2 shows part of a scaffolding very similar to Figure 1, but adapted for use with thinner standard formwork of, say, 19 mm thickness. With the arrangement of Figure 1, such formwork, if supported on the flanges

10, would be 6 mm below the upper surfaces of the secondary beams so that the desired flush effect would not be obtained. In order to adapt the scaffolding for 19 mm formwork, cross beams 20 are employed, resting on the flanges 10 of the secondary beams and bridging between the latter. The cross beams are arranged so that when in position on the flanges 10, their upper surfaces are 6 mm above the flanges, thereby raising the 19 mm thick formwork into flush relationship with the upper surfaces of the secondary beams.

The beam 20 used in the arrangement of Figure 2 is shown in more detail in Figure 5B. This is basically of inverted top hat section but has end plates 10E forming longitudinally extending flanges 41 of 6 mm thickness and hooked ends 42 for engaging the head slots 55 and flanges 56 or channels of the flanges 10 as before. When such a beam is in supporting position, as illustrated for example in Figure 2, with the hooked ends engaged as aforesaid, formwork supported thereby will be disposed with its peripheral portion flush with the upper surfaces of the secondary beams, again as shown in Figure 2.

It is sometimes required to use formwork consisting of steel sheet panels which are normally of standard thickness e.g. 2". For this purpose, the primary and secondary beams would be of the kind shown in Figure 5D in which the supporting flanges 10 are located 2" below the upper surface of the beam. The beam of Figure 5D has a downwardly extending tongue 10F at each end thereof which act, as described above, to locate the beam in position on the head units or beams.

The beam of Figure 5C is also for use with steel sheet formwork and is arranged and dimensioned so that outwardly extending flanges 44 thereof may rest on the flanges 10 of a beam such as that in Figure 5D to enable the beam of Figure 5C to act as an intermediate beam to support standard 19 mm or 25 mm formwork for example. The upper surfaces of its flanges 10 will be disposed below the upper surfaces of the main primary and secondary beams by the thickness of such formwork. Figures 5C and 5D show an alternative manner of locating the beam of Figure 5C in position. Thus, holes 45 are provided at intervals along the flanges 10 of the beam of Figure 5D and the flanges 44 are provided with pegs 46, which may be inserted in selected ones of the holes 45 for alternative positions of the beam of Figure 5C.

Figure 3 shows scaffolding which is basically similar to that shown in Figure 2, but which is provided with cantilever extensions on one or more sides of its periphery to facilitate the erection of the scaffolding in a corner or along a side of a structure when the ground area to be covered is larger than that of a standard size scaffolding module or group

of such modules, as governed by the lengths of the primary and secondary beams. Cantilever supports 30 are secured to support heads and receive additional support by means of struts 31 engaging the adjacent scaffolding members 1. The upper surfaces of the cantilever supports 30 are at a level 25 mm below the upper surfaces of adjacent secondary beams 9 and 9A i.e. they are at the level of the primary beams 8. Lengthwise support beams 32 identical with the primary and secondary beams are supported on the longitudinal flanges 10 of the cantilever beams 30 so that the upper surfaces of the beams 32 are at the same level as those of the secondary beams 9 and 9A. A flush surface can thus be provided between the upper surfaces of the secondary beams 9 and 9A and beams 32 by using plywood of appropriate thickness, which would normally be 25 mm.

In order to create a cantilever in the direction at right angles, further cantilever beams 33 are secured to adjacent support heads and lengthwise support beams 34 are supported on the flanges 20 of the supports 33. Although the upper surfaces of the supports 33 are 50 mm below the upper surfaces of the secondary beams 9 and 9A, the upper surfaces of the lengthwise supports 34 are 25 mm below the upper surfaces of the secondary beams so that a flush surface may be provided with the upper surfaces of the secondary beams by using plywood of appropriate thickness which would normally be 25 mm. It will thus be seen that, even when the scaffolding members 1 cannot be erected close to a wall, as for example in a corner, it is still possible to extend a flush support surface outwardly to provide a substantially continuous surface for supporting cast concrete. Only the extreme corner portion, having cantilever beams with upper surfaces disposed respectively at levels 25 and 50 mm below the upper surfaces of the secondary beams, require specialised infill to make a totally continuous rectangular casting surface.

It will be understood that, although a rectangular system having six scaffolding support poles has been described, the system can be erected in a variety of configurations using any desired number of support poles. Moreover, although the head 5 has been shown as having separate upper and lower movable portions 52 and 53, it would be possible for these portions to form a single piece.

CLAIMS

1. A formwork support system for use in the casting of a concrete structure comprising a plurality of support heads each adapted to be mounted on a respective generally vertical scaffolding member, a plurality of primary beams each adapted to be supported by respective heads on a spaced pair of said mem-

- bers, a plurality of secondary beams adapted to be supported by said heads to extend transversely of the primary beams with their upper surfaces disposed above those of the primary beams by a distance equal to the thickness of a peripheral portion of formwork of the system, the beams each having longitudinally extending support flanges arranged so that, when they are acting as primary beams, further secondary beams extending transversely thereof may be supported on the flanges with their upper surfaces disposed by said distance above those of the beams upon which they are supported.
2. A system according to Claim 1 wherein each head has a portion movable between upper and lower positions and releasably lockable in said upper position.
3. A system according to Claim 1 or Claim 2 wherein at least some of the support flanges include a pair of flange portions extending generally perpendicular to a side of the beam joined by a flange portion extending generally parallel to that side, whereby a locating channel is formed between the parallel flange portion and that side.
4. A system according to any one of the preceding claims wherein the beams are provided with projections for co-operation with formations on the heads and with the support flanges of the beams.
5. A system according to any one of the preceding claims wherein caps are provided at the upper ends of the heads to support part of the cast concrete structure.
6. A system according to Claim 5 when appendant to Claim 2 wherein the movable parts of the heads are movable relative to the caps, whereby the beams may be lowered and removed after casting of the structure, leaving the caps supporting said structure.
7. A system according to any one of the preceding claims wherein the heads have supporting formations at different levels respectively for primary and secondary beams.
8. A system according to Claim 7 wherein each head has a support plate providing laterally extending portions each with a locating slot therein and arranged to support respective beams at one of said levels, and upwardly projecting flanges on the support plate extending in a lateral direction perpendicular to said portions of the support plate and arranged to support respective beams at another of said levels.
9. A system according to any one of Claims 2 to 8 wherein the movable portion of the head is in two parts, an upper one of which provides direct support for the beams and a lower one of which co-operates with locking means selectively operable to retain the head in its raised position and to release it from that position.
10. A formwork support system substantially as hereinbefore described with reference

to Figure 1, Figure 2 or Figure 3 of the accompanying drawings.

11. A support head for use with the system of any one of Claims 1 to 10 comprising an upright portion adapted for support by a scaffolding upright, and a support member for movement along the upright portion between upper and lower positions, means for retaining the support member in its upper position in which it forms, in use, a support for part of a cast structure, formation being provided on said upright portion for locating beams at different levels in said system.
12. A support head according to Claim 11 including a support plate providing laterally extending portions each with a locating slot therein and arranged to support respective beams at one of said levels, and upwardly projecting flanges on the support plate extending in a lateral direction perpendicular to said portions of the support plate and arranged to support respective beams at another of said levels.
13. A support head according to Claim 11 or Claim 12 wherein the movable portion of the support head is in two parts, an upper one of which provides direct support for the beams and a lower one of which co-operates with locking means selectively operable to retain the head in its raised position and to release it from that position.
14. A support head for use with the system of any one of Claims 1 to 10, substantially as hereinbefore described with reference to Figures 4A and 4B of the accompanying drawings.

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